Nematology Circular No. 164
April 1989

Fla. Dept. Agric. & Consumer Serv.
Division of Plant Industry

# A DISEASE OF BEGONIA CAUSED BY A FOLIAR NEMATODE, APHELENCHOIDES FRAGARIAE.

P. S. Lehman[1]

Almost a hundred years ago, in 1890, a foliar nematode was first reported causing a disease on begonia leaves in England (16). In the United States, foliar nematode disease on begonia was observed in Oregon as early as 1920 (3). During the past 100 years considerable information on the biology and control of this nematode on begonia has been generated from research in Europe and the United States. This nematode disease, however, is frequently a problem for commercial begonia growers. Sanitation or cultural practices are especially important for controlling this disease. This circular provides growers with a summary of the most important biological information on the disease and its application for control practices.

HOST RANGE AND SYMPTOMS: Aphelenchoides fragariae (Ritzema-Bos) Christie is the nematode species almost always associated with foliar nematode disease on begonia. In 1892, Ritzema-Bos first described this nematode from begonia as Aphelenchus olesistus, and later it was known as Aphelenchoides olesistus. Eventually it was synonymized with A. fragariae (1,15). Another foliar nematode species, A. ritzemabosi (Schwartz) Steiner, has been, on rare occasions, isolated from diseased begonia leaves (Personal communication, R. M. Riedel). Aphelenchoides fragariae has a wide host range, encompassing approximately 250 species of plants in 50 families (4,11). It is commonly found on ferns and economically important plants in the families Liliaceae, Primulaceae, Gesneriaceae. and Begoniaceae.

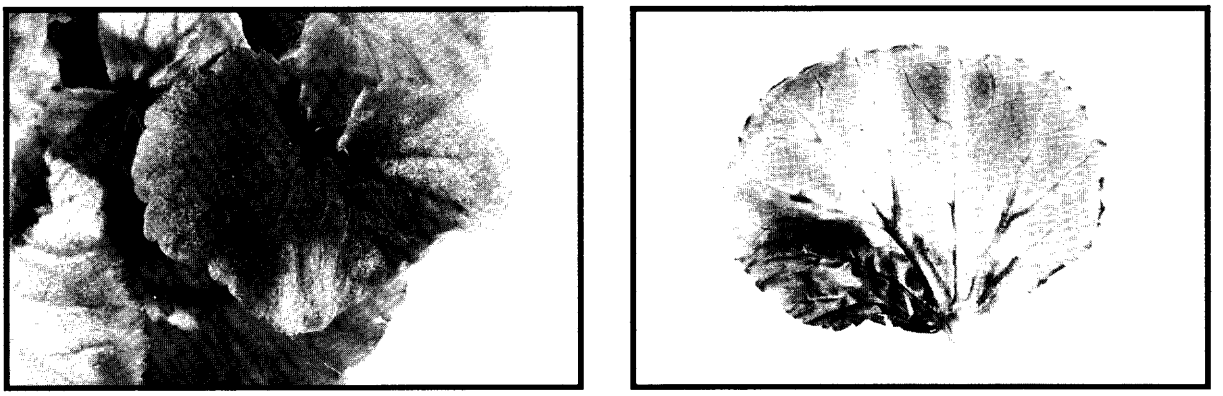

Fig. 1. Symptoms caused by Aphelenchoides fragariae on begonia. Left: severe reddening and discoloration; right: necrosis along the veins and other portions of the leaf.

There are over 1000 species of begonias, and over 200 species are grown commercially in the floriculture industry in the United States (8). The host range of A. fragariae in begonias is wide, but symptoms vary depending on the type of begonia and cultivar. Most Rieger begonia cultivars are especially susceptible to this nematode (7). Pierson (7) inoculated 15

[1]Nematologist, Bureau of Nematology, P.O. Box 1269, Gainesville, FL 32602

elatior hybrid cultivars of Rieger begonia (Begonia X hiemalis Fotsch.) and all were susceptible to A. fragariae. The first symptom that develops on cultivars Schwabenfeuer, Improved Schwabenland Orange, Improved Schwabenland Pink, Schwabenland Gold, Schwabenland Red, Crispa, Krefeld Red, and Bernstein's Gelbe, is flecks on the veins. Then a light reddish hue and water soaking of the leaf becomes visible. The leaf later assumes a deep reddish hue. Necrosis develops along the veins and other parts of the leaf, beginning at the margins (Fig. 1). Eventually the entire leaf may become necrotic and desiccated, but it may remain attached to the petiole for 2 to 3 weeks (7,17). Symptoms on the cultivar Orangefeuer are masked by the natural deep reddish hue of the leaves. Symptoms on Aphrodite cultivars may be easily overlooked. Cultivars such as Aphrodite Red, Aphrodite Rose, Aphrodite Cherry Red and Aphrodite Pink exhibit light water-soaking as the first symptom of nematode damage, followed by a slight bronzing of the leaf. Light red leaf coloration developed in some Aphrodite cultivars 5 weeks after inoculation. At 6 weeks, however, other Aphrodite cultivars, such as Aphrodite Rose, did not develop any red coloration even though over 31,000 nematodes were recovered per gram of leaf tissue (7).

Cultivars of tuberous begonia such as Double Camiella, Pendula, Multiflora Maximum and Mamora are susceptible to A. fragariae. The first symptoms in these cultivars are water soaking of infected areas, followed by mild chlorosis. After several weeks leaf margins may become necrotic (7).

Several cultivars of Lorraine elatior begonias are known to be susceptible to foliar nematode (7,18). Three weeks after the cultivar Melior was inoculated with nematodes, light bronzing occurred along the leaf veins which remained green. Several weeks later the entire leaf became necrotic. In some cultivars the first symptom is water soaking and yellowing of the leaf margins followed by necrosis of the entire leaf (18).

Fiberous rooted begonias may serve as symptomless carriers of foliar nematodes. Red Comet, Pink Comet, White Tausendchon, Scarletta and Pink Pearl cultivars were good hosts for foliar nematode, but no symptoms were observed on these fiberous root begonias (7).

Many Rex begonias, such as cultivars Little Pet, Lucille Claussen, Fairy, Vesuvius, Tried and True, Helen Treupel, Helen Lewis, Shirt Sleeves, Merry X-mas, and Winter Queen appear to be resistant to foliar nematode (7).

Reddening of begonia leaves may also be due to sunscald. Leaf necrosis is also a symptom of other common diseases of begonia such as fungal leaf blight caused by Botrytis cinerea Pers. and bacterial leaf spot caused by Xanthomonas begoniae (Takimoto) Dowson (8). Bacterial leaf spot symptoms appear earlier and are more severe in concomitant infections of A. fragariae and X. begoniae (13).

LIFE CYCLE AND BIOLOGY: Important aspects of the life cycle and biology of foliar nematodes which relate to effective disease control strategies are:

1. On the leaf surface, foliar nematodes withstand intermittent wetting and drying. In dried infested dead begonia leaves they may survive at least 11 weeks (5,7).
2. In high humidity or when there is free moisture on the leaves, many nematodes may move from within the leaf tissue to the leaf surface

where they are disseminated by splashing or by their own active movement (5,7).

3. After dissemination, nematodes readily penetrate the leaves or stems of begonia. They may enter the leaf through stomata or through natural wounds (5,7,18). They can also directly penetrate uninjured stems and leaves. Nematodes may move systemically through the vascular system of stems and leaves (7,17). Frequently, many nematodes penetrate at the same site, but even if only one gravid female penetrates a leaf, foliar nematode disease may develop in subsequent weeks (7).
4. Foliar nematodes reproduce at temperatures favorable for begonia growth. The number of eggs laid by females ranges from 24 to 43. The first molt occurs within the egg. Second stage juveniles hatch from eggs in approximately 4 days. Second, third and fourth stage juveniles, as well as adults, feed endoparasitically on spongy mesophyll cells. At temperatures of 17 to 24 C the generation time is 10 to 12 days (18).

CONTROL: As early as 1938, hot water treatments were developed to control foliar nematodes in begonia stock plants (6). A general range of time-temperature combinations from 45 C for 5 min. to 50 C for one min. has been effective depending on the cultivar and foliar nematode population (2,6). Hot water treatments must be used with great care, since the difference in lethal threshold between the host and nematode is very narrow, and the treatment may have other undesirable secondary effects, such as altering plant growth or disseminating fungal and bacterial plant pathogens.

Many chemicals have been used to control foliar nematodes on begonia (5,9,10,12,14,17). Phytotoxicity has been observed with certain chemicals (9). Because foliar nematodes are endoparasites and may move systemically in begonia, systemic nematicides are most effective in control of this disease (14,17). It is important to remove diseased foliage and debris of begonias that may serve as an inoculum reservoir. Cultural practices should be regarded as the primary line of defense, since chemical control alone is rarely effective. The following cultural practices will help prevent foliar nematodes from becoming established or disseminated within commercial growing areas:

1. Plants purchased from other sources should be free of symptoms caused by foliar nematodes. Whenever possible, these plants should be isolated from other plants for a number of weeks to observe if any symptoms develop.
2. Potting materials, tools, soil, propagation stock, and benches on which plants are grown should be nematode free.
3. Excess moisture on the foliage should be reduced by:
   a) Eliminating overhead watering or splashing when irrigating.
   b) Watering early in the day and reducing or eliminating watering on cloudy days.
   c) Using heat and ventilation to reduce natural increases in greenhouse relative humidity caused by falling temperatures.
   d) Removing some of the large leaves at the base of the plant to allow for better air circulation in the interior of the plant.
4. It is especially important that careful sanitation practices are followed in areas where stock plants are grown. If possible, physically separate different types of begonias, especially types such as fiberous root begonias and Aphrodite cultivars of Rieger begonias

that are known to be symptomless carriers of foliar nematodes. Allow enough space between plants to prevent leaves from touching those of adjacent plants.

LITERATURE CITED:


1. Allen, M. W. 1952. Taxonomic status of the bud and leaf nematodes related to Aphelenchoides fragariae (Ritzema Bos). Proc. Helminth. Soc. Wash. 19:108-120.
2. Christie, J. R., and L. Crossman. 1935. Water temperatures lethal to begonia, chrysanthemum, and strawberry strains of the nematode Aphelenchoides fragariae. Proc. Helminth. Soc. Wash. 2:98-103.
3. Courtney, W. D.,and H. J. Reynolds. 1935. Aphelenchoides fragariae (Nematoda: Anguillulinidae) infesting begonias in the Pacific Northwest. Proc. Helminth. Soc. Wash. 2:59-61.
4. Crossman, L., and J. R. Christie. 1936. A list of plants attacked by the leaf nematode, Aphelenchoides fragariae. Plant Dis. Rep. 20:155-165.
5. Gill, D. L. 1933. Leaf nematode diseases of begonia. Florist Exchange and Horticultural Trade World 4:81.
6. Guba, E. F., and C. J. Gilgut. 1938. Control of begonia leaf blight nematode. Mass. Agr. Exp. Sta. Bull. No. 348. 12 pp.
7. Peirson, D. Q. 1974. Epidemiology of a foliar disease of Rieger Elatior begonias caused by Aphelenchoides fragariae. M.Sc. Thesis, The Ohio State University, Columbus, Ohio, 58 pp.
8. Powell, C. C. 1985. Begonia, pp. 423-445 In: Diseases of floral crops, Vol. I (D. L. Strider, ed.) Praeger, New York. 638 pp.
9. _____, R. M. Reidel, and V. R. Walter. 1975. The effect of aldicarb on Aphelenchoides fragariae on Rieger begonia. Plant Dis. Rep. 59:370-372.
10. Rasmussen, A. N. 1971. Control of leaf nematodes in Lorraine Begonia. Gartner Tidende 87:303-304. Helminth. Abstracts 41:179.
11. Riedel, R. M. 1985. Nematode problems, pp. 295-312. In: Disease of floral crops. Vol. I. (D. L. Strider, ed.) Praeger, NY. 638 pp.
12. _____, D. Q. Peirson, and C. C. Powell. 1973. Chemical control of foliar nematodes (Aphelenchoides fragariae) on Rieger begonia. Plant Dis. Rep. 57(7):603-605.
13. _____, and P. O. Larsen. 1974. Interrelationship of Aphelenchoides fragariae and Xanathomonas begoniae on Rieger begonia. J. Nematol. 6:215-216.
14. _____, and C. C. Powell. 1974. Control of Aphelenchoides fragariae on Rieger begonia with oxamyl. Plant Dis. Rep. 58:911-913.
15. Ritzema-Bos, J. 1892. Aphelenchus olesistus nov. spec., een nematode chadelijk aan begonia's en varens (Voorloopige medeleeling). Maandbl. Natuurwetensch. 17::101-112.
16. Smith, W. G. 1890. Disease of begonias caused by nematode worms. The Gardner's Chronicle, Sept. 13, 2:298.
17. Strider, D. L. 1973. Control of Aphelenchoides fragariae on Reiger begonias. Plant Dis. Rep. 57(2):1015-1019.
18. Strumpel, H. 1967. Beobachtungen zur Lebenswise von Aphelenchoides fragariae in Lorraine Begonia. Nematologica 13(1):67-72.



Contribution No. 378, Bureau of Nematology

This publication was issued at a cost of $ 631.27 or $ 0.18 per copy to provide information on proper recognition of plant pests. PI89T-20